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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/782,545 | 02/19/2004 | Martin R. Roscheisen | NSL-025 | 2677 |

27652 7590 11/08/2005

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| EXAMINER | |
|---|---|
| ABRAMOWITZ, HOWARD E | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1762 | |

DATE MAILED: 11/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/782,545 | ROSCHEISEN ET AL. | |
| | Examiner | Art Unit | |
| | Howard E. Abramowitz | 1762 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *16 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *2-5 and 14-34* is/are pending in the application.

4a) Of the above claim(s) *24-34* is/are withdrawn from consideration.

5)☒ Claim(s) *22 and 23* is/are allowed.

6)☒ Claim(s) *2-5 and 14-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *2-5 and 14-34* are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/26/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election with traverse of group I claims 1-23 in the reply filed on 9/16/05 is acknowledged. The traversal is on the ground(s) that a linking claim (claim 34) has been added and that the restricted claims must be rejoined upon allowance of the linking claim. This is not found persuasive because as described in MPEP 809.03 "There are a number of situations which arise in which an application has claims to two or more properly divisible inventions, so that a requirement to restrict the application to one would be proper, but presented in the same case are one or more claims (generally called "linking" claims) inseparable therefrom and thus linking together the inventions otherwise divisible." Claim 34 is not a proper linking claim as it is not inseparable from the two groups of claimed inventions particularly the apparatus could be used for a materially different method namely conventional CVD.

The requirement is still deemed proper and is therefore made FINAL.

### *Response to Amendment*

Applicant's amendment's filed 9/16/05, have been fully considered and reviewed by the examiner. Examiner notes the amendments to the specification and that no new matter has been added. Claim 1 has been canceled, claims 2, 14, 17-22, 25-33 have been amended and claim 34 has been added as a linking claim. Currently claims 2-5 and 14-34 are pending in the application.

***Response to Arguments***

Applicant's arguments filed 9/16/05 have been fully considered but they are not persuasive.

Applicant's arguments with respect to claims 19-21 as being anticipated by Iszcukiewicz have been considered but are moot in view of the new ground(s) of rejection.

The applicant has argued that the breadth of the word "coiling" as used in the present case cannot go beyond the plain meaning of that term which would be reasonable to one of ordinary skill in the art. The applicant goes on to cite dictionary definitions for the word coiling. The examiner has not found this argument persuasive because the very definitions cited by the applicant submit that the definition of coiling is "to form or lie in a coil" (remarks page 9 line 14) which is the broad definition originally given by the examiner.

The applicant argues that "coiling one or more substrates into one or more coils" would mean "winding, rolling or twisting or otherwise forming the substrates into coiled or spiral shapes" (remarks page 9 lines 15-20). The examiner argues that the applicant's very definition of "otherwise forming substrates into coiled or spiral shapes" is open to forming the coils by etching them into a substrate.

The applicant further argues that the word coil is not used in Chan et al. but rather a "spiral structure" is used to describe the structure formed by Chan et al.. The examiner submits that spiral is synonymous with coil as can be found in the very definitions given by the applicant (remarks page 9 line 20).

Applicant's arguments with respect to claims 14-16 as being anticipated by Meyer have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments against Chan et al. being used for the 35 U.S.C. 103(a) references are not found persuasive for the reasons cited above.

In the applicant's argument against Meyer, regarding claim 18, the applicant argues a prima facie case of obviousness is not present. The examiner argues that duplicating a part for multiple effect is obvious *In re Harza*, 274 F.2d 669, 671, 124 USPQ. Accordingly a prima facie case of obviousness exists for the rejection. Regarding claim 17, the applicant argues that "a prima facie case of obviousness is not present and that to say that there are only three ways to coil a substrate around a carousel and that any of the three methods would be operable is not obvious. The examiner argues that "The test of obviousness is not express suggestion of the claimed invention in any or all references but rather what the references taken collectively would suggest to those of ordinary skill in the art presumed to be familiar with them." *In re Rosselet*, 347 F.2d 847, 146 USPQ 183 (CCPA 1965); *In re Hedges,* 783 F.2d 1038.

The prior art teaches to coil the substrate around the carousel and exemplifies doing so by rotating the carousel while holding the substrate in a stock reel stationary. From the prior art disclosure one of ordinary skill in the art would readily recognize that rotating a stock reel around a stationary carousel or simultaneously rotating both the stock reel and the carousel would be the only operable way to obtain the structure necessary in the prior art and hence would be motivated to use any of the three operable methods with a reasonable expectation of achieving the substrate coiled around the carousel. Alternatively, the examiner argues that holding the carousel still and winding the substrate around the stationary carousel and holding the substrate still and rotating the carousel are actually the exact same motion and differ only in the perspective of the observer. A person standing afar watching a carousel wind and a stationary substrate would see just that, however to a person standing on the carousel it would appear that the carousel is stationary and it is the substrate that is moving around the carousel. It clearly would be obvious that simply changing the frame of reference is not a novel process and that one of ordinary skill in the art would recognize that these two processes are in fact one and the same. For more information on relative motion see Cutnell and Johnson *Physics* pages 71-73 cited herewithin.

***Claim Rejections - 35 USC § 102***

Claim 2 is rejected under 35 U.S.C. 102(e) as being anticipated by Chan et al. (6,716,693).

Referring to claim 2, Chan et al. discloses a method of treating a substrate surface comprising coiling a substrate into one or more coils in such a way that adjacent turns of the coil do not touch one another. Here the term coiling is taken in its broadest reasonable interpretation, which is, to form coils. Chan et al. form coils by etching away a sacrificial silicon nitride layer (figure 5a, column 5-6 lines 57-34). Chan et al. place the substrate in an atomic layer deposition chamber and apply a bottom copper barrier layer by an ALD reaction.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al. as applied to claim 2 above, and further in view of Marsh (US Patent No. 6,830,983).

Referring to claims 3 and 5, Chan et al. disclose forming a TiN layer using an ALD surface reaction (column 6 lines 55-62). Chan et al. does not disclose using $MCl_x$ as a reactant vapor or more specifically $TiCl_4$. However, Marsh teaches that when forming a TiN film $TiCl_4$ is a starting material that will yield TiN when in combination with $NH_3$ in an ALD process (column 7 lines 34-47). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chan et al. to use $TiCl_4$ when forming a TiN film as suggested by Marsh because using $TiCl_4$ and $NH_3$ would have reasonably been expected to successfully provide a TiN layer formed by ALD as is required by Chan et al..

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al. as applied to claim 2 above, and further in view of Norman et al. (US Patent Application Publication 2002/0013487).

Chan et al. discloses all of the features of claim 4 except it does not disclose exposing the substrate to water vapor during the ALD reaction. However, Norman et al. teaches that when forming copper interconnects, like those in Chan et al., for semiconductor devices it is desirable to use water as an oxidizer in an ALD reaction to bond copper to the surface before reducing the copper oxide to pure copper (paragraph 26). Accordingly, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify Chan et al. to use water as an oxidizing agent when depositing the Cu seed layer by ALD as taught by Norman et al. with the expectation of successfully forming copper interconnects bonded to the substrate.

Claims 2-5 and 14-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goedicke et al. (US Patent No. 5,614,273) in view of Iszczukiewicz (3,923,556) in further view of Iizuka et al. (US Patent No. 6,875,667).

Referring to claims 2-5, Goedicke et al. discloses that it is desirable to coat a steel sheet with a corrosion resistant coating of titanium oxide (column 6 lines 48-50). Iszczukiewicz discloses a method for forming treating a steel sheet where the sheet is coiled with a spacer placed in between the coils as discussed above and that this method creates stability and allows for treatment gas to flow in between the layers of coils (column 1 lines 5-13). Iszczukiewicz further discloses that the treatment may involve modifying the chemical composition of the strip or applying materials to the surface of the strip using gas phase treatment (column 1 lines 19-37). Goedicke et al in view of Iszczukiewicz does not specifically teach using ALD to deposit the titanium oxide. However, Iizuka et al. teaches that ALD using $TiCl_4$ and water is a conventional way to form a $TiO_2$ film (column 8 lines 10-40). Accordingly, it would have been obvious to modify Goedicke et al. in view of Iszczukiewicz to use an ALD process as taught by Iizuka et al. with a reasonable expectation of successfully forming the $TiO_2$ layer.

Referring to claim 14, Iszczukiewicz discloses attaching an end of a roll of substrate material to a carousel, rotating the carousel while unrolling the substrate

material and placing a spacer between adjacent layers of the coiled substrate (figure 1, column 1 lines 55-68).

Referring to claim 15, Iszczukiewicz discloses the spacer comprises both horizontal and vertical spacers, from figure 3 it is clear that the vertical spacers touch the back but not the front of substrate.

Referring to claim 16, Iszczukiewicz discloses that the horizontal spacers are stacked on the back of the vertical spacers; alternatively the individual horizontal spacers are stacked on top of one another (figure 3).

Referring to claim 17, Iszczukiewicz does not expressly teach moving the roll of substrate material around the carousel as a method of forming the coiled substrate. However, it is clear that there are only three possible ways to coil the substrate from a roll around a carousel: rotate the roll around the carousel holding the carousel stationary; rotate the carousel around its central axis while holding the roll of substrate material stationary; or rotate the roll around the carousel while concurrently rotating the carousel about its central axis. Any of these three methods would clearly be suitable to coil the substrate around the carousel and there would appear to be no advantage to performing any one of these methods over the others. Thus it would have been obvious to one of ordinary skill in the art to rotate the roll of substrate material around the carousel as opposed to rotating the carousel while holding the substrate material stationary because doing so would have been expected to successfully produce the coiled substrate required by Iszczukiewicz. See also the reasons under response to arguments with the response to Meyers.

Referring to claim 18, Iszczukiewicz does not expressly teach placing two or more coiled substrates side by side. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place more than 1 substrate side by side during the treatment of the substrates with an expectation that a greater amount of treated substrate could be made in the same amount of time. Furthermore it has been found obvious that duplicating a part for multiple effect is obvious *In re Harza*, 274 F.2d 669, 671, 124 USPQ.

Referring to claims 19, 20 and 21, Iszczukiewicz discloses that the spacers being used are in a tape form that is parallel to a length of the substrate and includes passages running substantially along the width of the spacer tape (figure 1).

### *Allowable Subject Matter*

Claims 22 and 23 are allowed. The prior art does not anticipate or deem obvious to attach two substrates back to back and perform a treatment process on the coiled substrates. Iszczukiewicz discloses that the use of the spacers to keep adjacent turns of the coil from touching would allow for coating of both sides of the substrate, as the purpose of the spacers is allow for the flow of gasses to reach all sides of the substrate.

### *Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard E. Abramowitz whose telephone number is 571-272-8557. The examiner can normally be reached on monday-friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HEA

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER